TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
2 X 660 MW ENNORE SEZ STPP

TECHNICAL SPECIFICATION
FOR
COAL FLOWABILITY STUDY

SPECIFICATION NO. PE-TS-412-161-A001

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA-201301

VOLUME – IIB

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INTENT OF SPECIFICATION

1.1 A comprehensive coal flowability study of crushed, blended and imported coal for 2x660MW Ennore SEZ STPP shall be conducted by the bidder, for the coal bunker to ensure smooth flow of coal in all seasons with different moisture contents and different percentage of fines to promote mass flow without choking.

1.2 The general terms and conditions, instructions to tenderer and other attachment referred to elsewhere are made part of the tender specification. The works covered by this specification is subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.

1.3 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, any additional input, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Customer as and when brought to their notice either by the bidder or by customer themselves. However, such requirements shall be binding on the successful bidder without any commercial implication.

1.4 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.

1.5 Deviations, if any, should be very clearly brought out clause by clause in the deviation schedule along with cost of withdrawal; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.

1.6 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.

Section - B
(Project Information and Coal Analysis)

1.0 GENERAL BACKGROUND AND SALIENT FEATURES

1.1 Introduction

Tamilnadu Generation and Distribution Corporation owns the proposed green-field 1320 MW (2 units of 660 MW each) Coal Based Thermal Power Station at Katupalli. This is an expansion of North Chennai Thermal Power Station (NCTPS) and located on some portion of the ashdyke of NCTPS.

1.2 Location

The proposed site for main power plant is located near Ennore port (approx 5 kms).

The nearest Railway station is at Athipattu Pudunagar (approx 5 kms)

All weather road from Pattamandri on the Thiruvottiyur-Ponneri district highway is the nearest road access.

The nearest airport is at Chennai at a distance of 60 km.

1.3 Type of Plant

The proposed 2x660 MW Super-Critical Power Project consists of coal fired steam generator connected to a reheat type steam turbine generator along with all the required auxiliaries. Circulating cooling water system is envisaged for condenser cooling.

The description and salient technical data of the Steam Generator, Steam Turbine Generator, Auxiliary systems, Electrical, Control & Instrumentation, Civil etc. are explained elsewhere in the specification:

1.4 PROJECT INFORMATION

Project Title : **2 x 660 MW Ennore SEZ Coal Based Supercritical Thermal Power Project at Ash Dyke of NCTPS**

Owner : **TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)**

LOCATION

The site is located near Vayalur Village, Ennore

Latitude	:	$13^0$17' N to $13^0$18' N
Longitude	:	$80^0$18' E to $80^0$19' E
Distance from Chennai City	:	35 km
Nearest Airport is at Chennai at a Distance of	:	60 km
Nearest Seaport is	:	Ennore
Nearest Railway Station is	:	Athipattu Pudunagar (approx 5 kms)

Meteorological Condition

Climate : Tropical ,very dry and hot summer, dry and cold winter and good rain-fall in monsoon accompanied with strong wind.

Climatological data :

Ambient temp. (^{0}C)

Annual Maximum Mean Temp	41.5(^{0}C)
Annual Minimum Mean Temp	24(^{0}C)
Design Ambient temperature	35(^{0}C)

Relative Humidity

Maximum	100%
Minimum	36%
Design	75%

Annual Rainfall

Maximum	2540 mm
Average	1600 mm
Minimum	1175 mm

Prevailing Wind Direction

Nov to Jan – From NW & NE

Feb to Mar – From East & SE

Apr to May – From South & SE

June – From SW

July to Aug – From NW

Sept to Oct – From SE & SW

Wind Speed 11.8 kmph (avg)

50 kmph (max)

Seismic Zone III as per IS:1893-2002

1.5 Access to Site

Site is well connected to all weather road from Pattamandri on the Thiruvottiyur – Ponneri district highway. Site is located adjacent to the Chennai – Howrah broad gauge line and thus well connected by rail also.

1.6 Plant Rating, Capacity, Availability, PLF

Each of the two units shall have a Turbine maximum continuous rating (TMCR) of 660 MW at generator terminals based on the following site conditions.

- Ambient air temperature
- Condenser cooling water inlet temperature of 33°C and 9°C temperature rise across the condenser.
- Generator power factor of 0.85.
- Fuel specification as given elsewhere.
- Design temperature for electrical equipment is 50°C.

The VWO capacity of the steam turbine shall not be less than 105% of TMCR flow at rated parameters. Boiler maximum Continuous Rating (BMCR) will be established to match the steam flow at VWO conditions, but BMCR flow shall not less than 108% of TMCR flow.

The capacity of the unit is selected so as to deliver the rated output even after ageing that will occur between overhauls, as a result of deposition of salts in turbine blades, wear and tear etc.

The plant load factor (PLF) being considered is 85%.

1.7 Power Evacuation

Power will be evacuated from the proposed thermal power station at 400 KV voltage level through 400 KV transmission lines . The power evacuation lines would be double circuit 400 KV lines which will act as Line in & Line out circuit.

1.8 Site Selection

The following factors which influence the project site selection have been found very favourable to establish and operate the project.

a. Availability of fuel.
b. Existing power plant
c. Availability of adequate cooling water.
d. Availability of adequate land for locating the power plant with approach roads.
e. Suitability of land from topographical and geological aspects
f. Proximity of National Highways, Ports & Transport of fuel & heavy equipment.
g. Facility for interconnection with transmission and distribution system for evacuation of power.
h. Environmental aspects.

Total land required for the project is 500 acres which is under the possession of TANGEDCO.

1.9 Fuel

1.9.1 Source of Fuel

Domestic coal requirement for the power plant will be sourced from Kalinga block of Talcher coal fields, Mahanadi and IB valley coal fields in the state of Orissa. Coal will be transported by sea. The port of dispatch and port of receipt for domestic coal would be Paradip port and Ennore port respectively. Imported coal shall be sourced from foreign countries through sea to Ennore port.

Coal can be transported from coal mines to Ennore port by sea and unloaded at proposed coal berth-III. Further the coal can be transported to the proposed power plant through pipe conveyor which shall have a system capacity of 2 x 2000TPH.

The steam generator shall be designed for the following conditions :

- **Best Coal** – 100% Imported Coal
- **Design Coal** – 70% Imported & 30% Domestic Coal
- **Worst Coal** – 50% Imported & 50% Domestic Coal

FUEL ANALYSIS – COAL

DESCRIPTION (Source / Type)		UNIT	DESIGN COAL (70% IMP + 30% DOMESTIC COAL)	WORST COAL (50% IMP + 50% DOMESTIC COAL)	BEST COAL (100% IMPORTED COAL)	DOMESTIC COAL (FOR INFORMATION)
PROXIMATE ANALYSIS						
Fixed carbon		%	34.3	30.22	40.43	20
Volatile matter		%	31.22	27.73	36.45	19
Moisture		%	16.35	16.24	16.5	16
Ash		%	18.13	25.81	6.62	45
Total		%	100	100	100	100
HHV		kcal / kg	4789.4	4221	5642	2800
LHV		kcal / kg				
ULTIMATE ANALYSIS						
Carbon		%	50.4	43.91	60.12	27.7
Hydrogen		%	3.85	3.49	4.38	2.6
Sulphur		%	0.52	0.52	0.53	0.5
Nitrogen		%	1.19	1	1.48	0.52
Oxygen (difference)		%	9.44	8.82	10.37	7.26
Moisture		%	16.35	16.24	16.5	16
Ash		%	18.13	25.81	6.62	45
Carbonates		%	0.11	0.19	0	0.38
Phosphorous		%	0.01	0.02	0	0.04
HARD GROVE INDEX			52	52	51	52
ASH CHARACTERISTICS						
IT - Initial deformation temp.		°C	1191	1165	1230	1100
ST - Softening temp.	H = W	°C	1249	1235	1270	1200
HT - Hemispherical temp.	H = W / 2	°C	1314	1310	1320	1300
FT - Fusion temp.		°C				
ASH CONSTITUENTS						
A - $Si\ O_2$		%	43.06	47.77	36	59.54
A - $Al_2\ O_3$		%	18.43	21.45	13.9	29
B - $Fe_2\ O_3$		%	12.29	10.61	14.8	6.42
B - CaO		%	9.34	7.1	12.7	1.5
B - MgO		%	6.17	4.55	8.6	0.5
B - $Na_2\ O$		%	0.51	0.39	0.7	0.08
B - $K_2\ O$		%	1.19	0.85	1.7	0
A - TiO_2		%	1.04	1.2	0.8	1.6
P_2O_5		%	0.29	0.36	0.2	0.51
SO_3		%	7.5	5.42	10.6	0.25
Others		%	0.18	0.3	-	0.6
Base / Acid Ratio			0.47	0.33	0.76	0.09
Fe_2O_3 / CaO Ratio			1.32	1.49	1.17	4.28
Chloride						

1.0 SCOPE OF WORK

A comprehensive flow-ability study of crushed, blended and imported for 2X660 MW ENNORE SEZ STPP shall be conducted by the bidder for the coal bunker to ensure smooth flow of coal in all seasons with different moisture contents and different percentage of fines. The bunkers are required to promote mass flow without choking with the fines content and moisture content of coal samples indicated in the specification. The report of study shall contain the following:

a) Sample preparation & Size analysis - Preparation of required samples of coal for flow-ability studies and Size analysis of as received sample.

b) Moisture determination of as received coal.

c) Bulk density determination.

d) Bulk density variation with normal stress (compressibility test).

e) Coal flow-ability tests (Shear tests) shall be conducted for following combinations of Imported and Domestic coal. Imported and indigenous coal samples of requisite quantity (qty. to be informed by bidder) shall be delivered by BHEL to the successful bidder.

- Best Coal – 100% Imported Coal
- Design Coal – 70% Imported & 30% Domestic Coal
- Worst Coal – 50% Imported & 50% Domestic Coal

f) The tests shall be conducted for different moisture levels as deemed necessary against mild steel liner & stainless steel liner - SS 316L (liner is in bidder's scope) to establish following for all flow-ability condition

i. Wall angle of friction

ii. Effective angle of friction

iii. Flow Functions & Flow Factor and

iv. Storage time effect at 24 and 72 hrs

g) Evaluation of Mass Flow design parameters viz., slope of hopper with specified material of construction and critical outlet diameter to prevent cohesive arching at different moisture levels.

h) Any additional measure like poking holes/flow aiding device, if required, may please be suggested with details.

i) Angle of repose of the coal samples shall be measured and included in the study.

2.0 Additional information:-

a) Type of bunker – circular on top and conical on bottom.

b) Outlet diameter of bunker – 914 mm.

c) Maximum extraction rate of the bunker shall be considered as 63 TPH

d) Project Information and Coal analysis are attached as per Section-A

e) Amount of coal per bunker – 882 Tonnes

f) Material of construction of bunker shall be MS plate of IS: 2062, Gr. A. with 6mm thick SS 316L grade liner provided in bottom 1.0m of cylindrical portion and entire conical portion of bunker.

g) Particle size inside the bunker shall be (-) 25 mm. Flow-ability test shall be conducted for (-)25 mm coal size. In case it's not feasible to conduct on lumps, bidder shall conduct the test on coal fines and correlate their findings for lumps (-) 25mm coal size.

h) For all capacity (volume) calculation, unit weight of coal shall be assumed as 800 kg/m^3.

DRAWINGS/ DOCUMENTS TO BE SUBMITTED WITH THE BID FOR TECHNICAL EVALUATION

Bidder shall submit the following drawings / documents along with their bid

a) Copy of resolved pre-bid clarifications, if any, duly signed & stamped

b) **Deviation schedule** with reference to specific clauses of the specification along with reason for such deviation and cost-of-withdrawal in the format.

c) Un priced copy of price format indicating quoted/ not quoted against each row/column

d) The amount of coal samples (both imported and domestic) required by the bidder for testing shall be clearly indicated in their offer.

Note:

- OFFER WILL BE CONSIDERED AS INCOMPLETE IN ABSENCE OF ANY OF ABOVE DOCUMENTS.
- DOCUMENT OTHER THAN ABOVE, IF ANY, SUBMITTED WITH THE OFFER WILL NOT FORM PART OF CONTRACT AND ACCORDINGLY WILL NOT BE CONSIDERED FOR BID EVALUATION.

PRE-BID CLARIFICATION SCHEDULE

S. No.	Section / Clause / Page No.	Statement of the referred clause	Clarification Required

The bidder hereby certifies that above mentioned are the only clarifications required on the technical specification for the subject package.

SIGNATURE:_____

NAME:_____

DESIGNATION:_____

COMPANY: _____

DATE:_____

COMPANY SEAL